CLAIMS

What is claimed is:

1. A rotary actuator comprising:

a fixed structure;

a first prime mover having a first portion fixed to the fixed structure, and a second portion rotationally movable with respect to the first portion;

a second prime mover, having substantially identical performance characteristics to the first prime mover, having a first portion fixed to the fixed structure, and a second portion rotationally movable with respect to the first portion;

a first gearset having an input portion connected to the second portion of the first prime mover and an output portion;

a second gearset, having substantially identical performance characteristics to the first gearset, having an input connected to the second portion of the second prime mover and an output portion;

a first clutch having an input portion connected to the output portion of the first gearset and an output portion;

a second clutch having an input portion connected to the output portion of the second gearset and an output portion;

a first actuator output rotationally fixed to the output portion of the first clutch; and

a second actuator output rotationally fixed to the output portion of the second clutch.

2. The rotary actuator of claim 1 wherein the first and second gearsets are planetary gearsets.

3. The rotary actuator of claim 1 wherein the first and second actuator outputs are fixed to one another.

4. The rotary actuator of claim 1 wherein each prime mover comprises a field and an armature.

5. The rotary actuator of claim 4 wherein the fields and armatures are concentric.

6. The rotary actuator of claim 4 wherein the fields and armatures are disposed adjacent to one another.

7. The rotary actuator of claim 1 wherein the first prime mover is disposed inside and concentric to the second prime mover.

8. A rotary actuator comprising:

a fixed structure;

a first prime mover having a first portion fixed to the fixed structure, and a second portion rotationally movable with respect to the first portion;

a second prime mover, having substantially identical performance characteristics to the first prime mover, having a first portion fixed to the fixed structure, and a second portion rotationally movable with respect to the first portion;

a first gearset having an input portion connected to the second portion of the first prime mover and an output portion;

a second gearset, having substantially identical performance characteristics to the first gearset, having an input connected to the second portion of the second prime mover and an output portion;

a first clutch having an input portion connected to the output portion of the first gearset and an output portion;

a second clutch having an input portion connected to the output portion of the second gearset and an output portion;

an actuator output rotationally fixed to the output portion of the first clutch and the output portion of the second clutch.

9. The rotary actuator of claim 1 wherein the first and second gearsets are planetary gearsets.

10. The rotary actuator of claim 1 wherein the first prime mover is disposed adjacent to the second prime mover.

11. The rotary actuator of claim 1 wherein each prime mover comprises a field and an armature.

12. The rotary actuator of claim 11 wherein the fields and armatures are concentric.

13. The rotary actuator of claim 11 wherein the fields and armatures are disposed adjacent to one another.

14. The rotary actuator of claim 8 wherein the first prime mover is disposed inside and concentric to the second prime mover.

15. A rotary actuator comprising:

an actuator shell having a first axis disposed therein;

a first prime mover, disposed about the first axis and supported by the actuator shell, having a first fixed portion rigidly fixed to the actuator shell and a first rotatable portion rotatable with respect to the first fixed portion;

a second prime mover, disposed about the first axis and supported by the actuator shell, having a second fixed portion rigidly fixed to the actuator shell and a second rotatable portion rotatable with respect to the second fixed portion;

at least one rotary component in contact with and driven by the first rotatable portion of the first prime mover and the second rotatable portion of the second prime mover;

a differential cage, disposed about the at least one rotary component; and

an output shaft, rigidly coupled to the differential cage.

16. The rotary actuator of claim 15 wherein the center line of the output shaft is collinear to the first axis.

17. The rotary actuator of claim 15 wherein the first and second prime movers comprise permanent magnet disks.

18. The rotary actuator of claim 15 wherein the first and second prime movers rotate about the first axis supported by bearings supported directly by the actuator shell.

19. The actuator of claim 15 wherein the fixed portion of the first prime mover and fixed portion of the second prime mover are stationary magnetic fields rigidly held by outer walls of the actuator and are independently controlled by a power supply module.

20. The actuator of claim 15 wherein the rotatable portions of the first and second prime movers are gears.